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Neutrino energy reconstruction in the DUNE far detector

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A study is made of neutrino energy reconstruction in the DUNE far detector. This detector will consist of four modules of liquid argon time projection chambers (LArTPCs), each with a fiducial mass of 10kt; the study uses simulations of one of these modules. We have developed a method to reconstruct the neutrino energy taking advantage of the excellent spatial and energy resolutions of LArTPCs. For events selected as ν_{μ} CC interactions, the reconstructed energy is estimated as the sum of the momentum of the longest reconstructed track and the reconstructed hadronic energy. If the longest track is contained in the detector, its momentum is estimated from its range, while its momentum is estimated using multi-Coulomb scattering if it exits the detector. The hadronic energy is estimated using the charges of the reconstructed hits not in the track. For events selected as ν_{μ} CC interactions, the reconstructed energy is estimated as the sum of the energy of the reconstructed shower with the highest total hit charge and the reconstructed hadronic energy. The hadronic energy is estimated from the charges of the reconstructed hits not in the shower. This method can be applied to other neutrino experiments that use the LArTPC technology.

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